



Division of Particles & Fields

Snowmass Update

-- from Snowmass to Snowbird

Tao Han

University of Pittsburgh, 2021 DPF Chair

On behalf of the Snowmass Steering Group

NuFACT 2022

Cliff Lodge @ Snowbird, August 1, 2022



Snowmass

In June 28 - July 16, 1982, the APS DPF organized an workshop, to “assess the future of elementary particle physics, to explore the limits of our technological capabilities, and to consider the nature of future major facilities for particle physics in the US.”

DPF Chair Charles Baltay:

“... The 1982 DPF Summer Study was the first attempt in recent years to bring together physicists from the whole country to consider the future of our field from the point of view of the best overall national program. The DPF Executive Committee feels that this summer study was sufficiently useful in this last respect to hold similar summer studies at appropriate times in future years.”

**This spearheaded the SSC exploration, and more.
The tradition continued.**

Global-scale projects require long-term strategic plans

With year-long,
wide community efforts,
Snowmass on the Mississippi
July 29 – August 6, 2013

(~700 participants)



Snowmass 2013 highly successful:

(Report by December 2013)

<https://www.slac.stanford.edu/econf/C1307292/>

The year-long process laid out a roadmap
for great science opportunities,
resulted in broad community buy-in.

essential inputs to P5



“Particle Physics Project Prioritization Panel” (P5)

A subpanel of HEPAP

- Projects prioritized according to funding scenarios
- Science research directions in HEP
- Federal funding profile for the current and near-future projects in the decade.

Building for Discovery

Strategic Plan for U.S. Particle Physics in the Global Context

Distilled from the Snowmass 2013 inputs, five Science Drivers for the field:

- Use the Higgs boson as a new tool for discovery
- Pursue the physics associated with neutrino mass
- Identify the new physics of dark matter
- Understand cosmic acceleration: dark energy and inflation
- Explore the unknown: new particles, interactions, and physical principles.
 - 29 recommendations
 - Projects prioritized according to funding scenarios

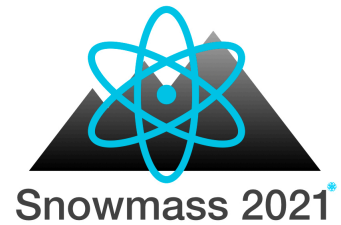
As a result, highly impactful on the

- Directions/achievements in HEP
- Federal funding profile

for the current and near-future projects in the decade.



Snowmass 2021 organization



Steering Group 2022

2022 Chair: Joel Butler

Chair-elect: R. Sekhar Chivukula

Vice Chair: André de Gouvêa

2021 Chair: Tao Han

2020 Chair: Young-Kee Kim

2019 Chair: Prisca Cushman

[DPB: Sergei Nagaitsev
DNP: Yuri Kolomensky
DAP: Glennys Farrar
DGRAV: Nicolas Yunes

Advisory Group 2022

- DPF Executive Committee
 - Secretary/Treasurer: Tulika Bose
 - Councilor: Bob Bernstein
 - Member-at-Large: Mary Bishai
 - Member-at-Large: Lauren Tompkins
 - Member-at-Large: Mayly Sanchez
 - Member-at-Large: Gordon Watts
 - Member-at-Large: Heather Gray
 - Member-at-Large: Kendall Mahn
 - Early Career Member: Julia Gonski
- Editor and Communication
 - Editor – Michael Peskin
 - Communication – Bob Bernstein
 - Technical Liaison – Sergei Chekanov
- Representatives from the Int. Community
 - Africa / Middle East
Azwinndini Muronga, Nelson Mandela
Metropolitan Univ, South Africa
 - Asia / Pacific
Atsuko Ichikawa, Kyoto University, Japan
Xinchou Lou, IHEP, China
 - Canada
Heather Logan, Carleton University
 - Europe / Russia
Val Gibson, Cavendish Laboratory, UK
Berrie Giebels, CNRS, France
Michelangelo Mangano, CERN
 - Latin America
Claudio Dib, Universidad Tecnica Federico
Santa Maria, Chile

Snowmass 2021 organization

10 Frontiers	80 Topical Groups
Energy Frontier	Higgs Boson properties and couplings, Higgs Boson as a portal to new physics, Heavy flavor and top quark physics, EW Precision Phys. & constraining new phys., Precision QCD, Hadronic structure and forward QCD, Heavy Ions, Model specific explorations, More general explorations, Dark Matter at colliders
Frontiers in Neutrino Physics	Neutrino Oscillations, Sterile Neutrinos, Beyond the SM, Neutrinos from Natural Sources, Neutrino Properties, Neutrino Cross Sections, Nuclear Safeguards and Other Applications, Theory of Neutrino Physics, Artificial Neutrino Sources, Neutrino Detectors
Frontiers in Rare Processes & Precision Measurements	Weak Decays of b and c, Strange and Light Quarks, Fundamental Physics and Small Experiments, Lepton Number Violation, Charged Lepton Flavor Violation, Dark Sector at Low Energies, Hadronic Physics, Photon
Cosmic Frontier	Dark Matter: Particle-like, Dark Matter: Wave-like, Dark Matter: Cosmic Probes, The Modern Universe, Dark Energy & Cosmic Acceleration: Cosmic Probes, Cosmic Acceleration: Complementarity of Probes and New Facilities
Theory Frontier	String theory, quantum gravity, black holes, Effective field theory, Formal QFT, Scattering amplitudes, Lattice gauge theory, Theory to experiment, Phenomenology, BSM model building, Astro-particle physics and cosmology, Neutrino Physics
Accelerator Frontier	Beam Physics and Accelerator Technology, Accelerators for Neutrinos, Accelerators for Electroweak and Higgs Physics, Multi-TeV Accelerators, Future Colliders & Rare Processes, Advanced Accelerator Concepts, Accelerator Targets, Targets/Sources
Instrumentation Frontier	Accelerator Detectors, Solid State Detectors & Tracking, Trigger and DAQ, Micro Pattern Gas Detectors, Electronics/ASICS, Noble Elements, Cross Cutting and System Integration, Radio Detection
Computational Frontier	Algorithm Parallelization, Theoretical Calculations and Simulation, Machine Learning, Storage and Computing resource access (Facility and Infrastructure R&D), End user analysis
Underground Facilities and Infrastructure Frontier	Underground Facilities for Neutrinos, Underground Facilities for Cosmic Frontier, Underground Detectors
Community Engagement Frontier	Applications & Industry, Career Pipeline & Development, Diversity & Inclusion, Physics Education, Public Education & Outreach, Public Policy & Government Engagement

30 Frontier conveners, ~250 Topical Group conveners,
>40 Inter-Frontier Liaisons, ~25 Early Career Liaisons.

Snowmass Early Career

to represent early career members and promote their engagement in the Snowmass 2021 process;
to build a long-term HEP early career community

Broad coverage/connection in science and global community!

Snowmass Community Planning Meeting

Oct. 5-8, 2020 (FNAL, virtual)

- ~ 3,000 people registered !
- 63 submissions to the “Voices from the Community”
- 25 Plenary speakers; 5 “Future Facilities” panelists
- 101 Breakout sessions
- 1,574 LOIs considered

Contributed (white) Papers solicited

- Specific scientific areas, technical articles presenting new results on relevant physics topics, and reasoned expressions of physics priorities, including those related to community involvement.
- Part of Snowmass proceedings. Remain part of the permanent record of Snowmass 2021, all on aiXiv
- Submission instructions: <https://snowmass21.org/submissions/>.

Heading to Community Summer Study (CSS) →

Snowmass 2021 in July 2021 @ UW-Seattle !

But the COVID-19 pandemic hit hard

→ Snowmass slowdown/paused for 8 months!

Snowmass Day

September 24, 2021

US/Central time zone

~ 1,000 registrants

AF	Vladimir Shiltsev	11:00 - 11:10
ComEF	Ketevi Adikla Assamagan	11:10 - 11:20
CompF	Benjamin Nachman	11:20 - 11:30
CosmF	Aaron Chou	11:30 - 11:40
EF	Alessandro Tricoli	11:40 - 11:50
IF	Petra Merkel	11:50 - 12:00
NF	Patrick Huber	12:00 - 12:10
PDE	Robert Bernstein	

Get all the frontiers and participants back together on the same page and refocus our attention to the Snowmass activities.

Monthly Snowmass Newsletters resumed!
October Newsletter out:

From the Steering Group

Dear Snowmass participants:

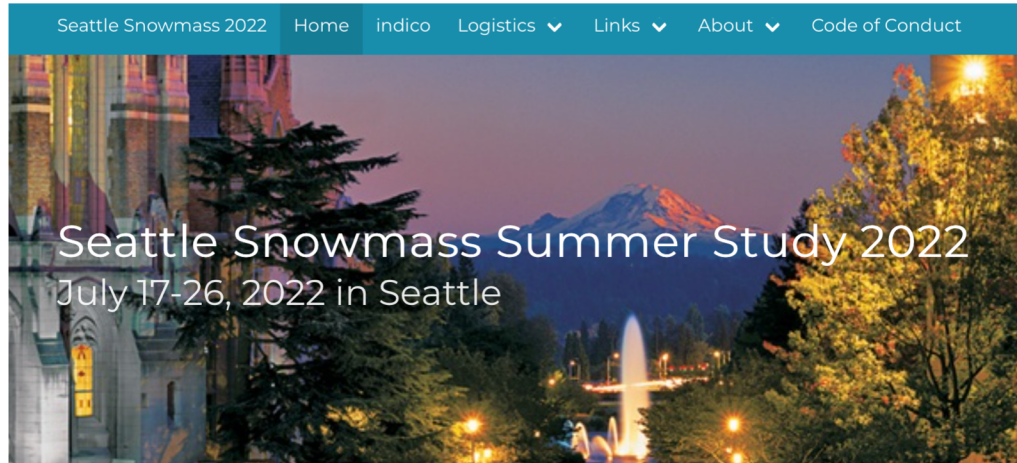
Greetings! After the pause/slowdown due to the COVID-19 pandemic since January 2021, the Snowmass Community process has resumed full activities in September 2021.

SEC	Julia Gonski	12:40 - 12:50
Steering Group	Tao Han	

Community Summer Study (CSS): Snowmass 2021

July 17 – 26, 2022 @ UW – Seattle

<http://seattlesnowmass2021.net>



Gordon Watts

email

Co-Chair of Local Organizing
Committee, Co-Chair of
Program Committee

Shih-Chieh Hsu

email

Co-Chair of Local Organizing
Committee, Co-Chair of
Program Committee

Participants

Number of in-person participants: 743

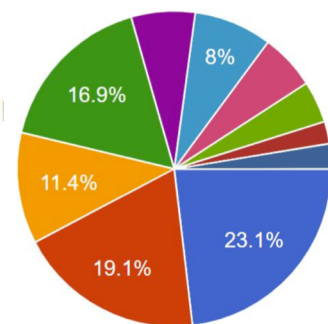
Number of virtual participants: 654

Local Organizing Committee/Volunteer/Press: 58

Total number of participants: 1397



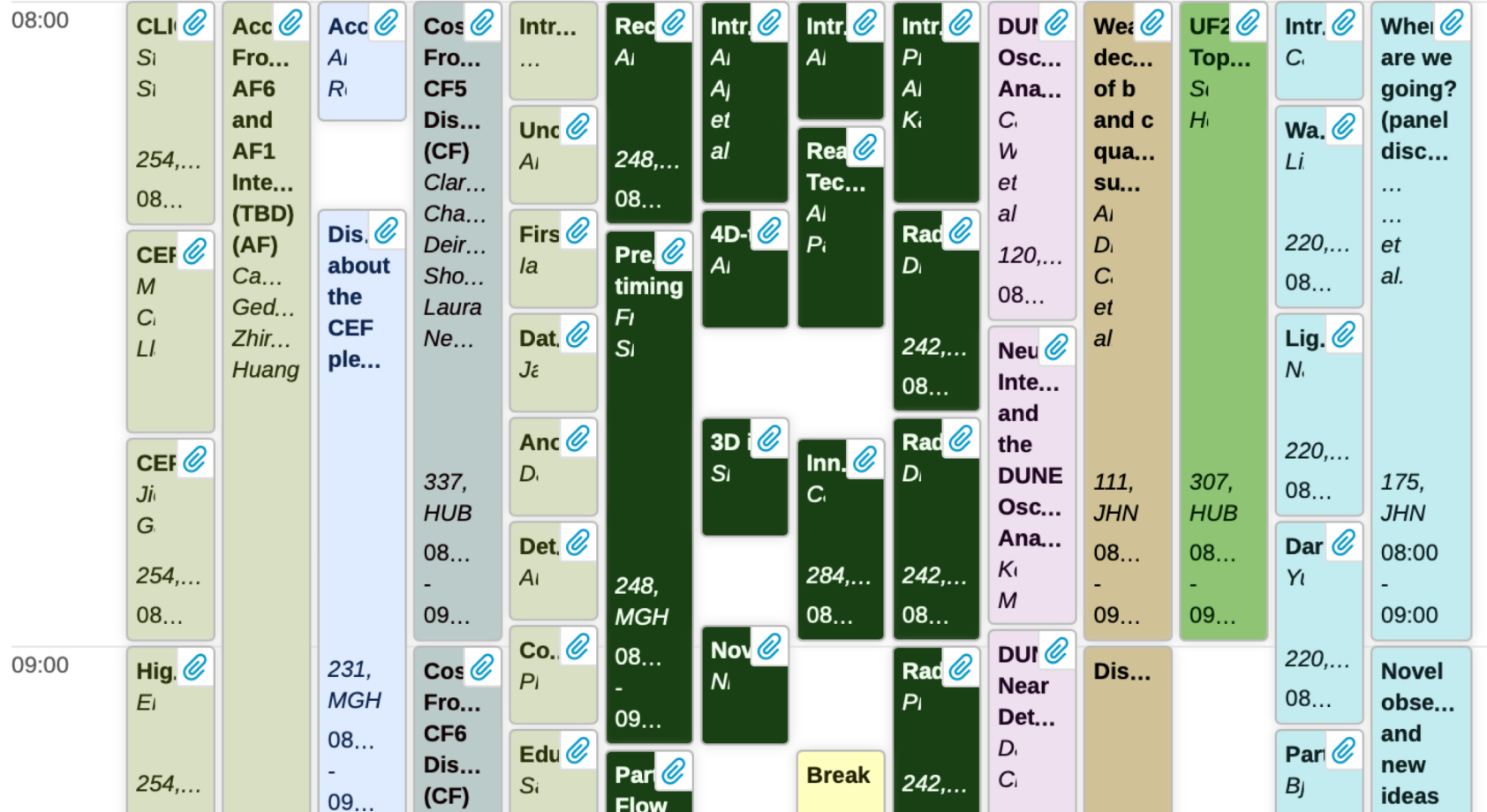
- Energy Frontier
- Neutrino Frontier
- Rare Process and Precision
- Cosmic Frontier
- Theory Frontier
- Accelerator Frontier
- Instrumentation Frontier
- Computational Frontier



NOTE: This schedule is not yet final	Computational Frontier											
	Saturday, July 16	Sunday, July 17	Monday, July 18	Tuesday, July 19	Wednesday, July 20	Thursday, July 21	Friday, July 22	Saturday, July 23	Sunday, July 24	Monday, July 25	Tuesday, July 26	
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	
	7:30 AM											
	8:00 AM	Registration								Snowmass Summary (Program under development)	National Study	
	8:30 AM										NAS EPP Decadal study	
	9:00 AM	Introductory Plenary	Parallel	Parallel	Parallel	Parallel	Parallel	Parallel	Snowmass Summary (Program under development)		Snowmass Summary (Program under development)	
	9:30 AM											
	10:00 AM											
	11:00 AM											
	12:00 PM											Closing Remarks
	1:00 PM		Lunch	Lunch, Poster & Exhibit	Lunch, Poster & Exhibit	Lunch, Poster & Exhibit	Lunch	Lunch	Lunch & Communicating HEP to the public and the govt.	Lunch	Lunch	
	2:00 PM		Introductory Plenary	Parallel 1: AI/ML Parallel 2: Underground	Panel: Careers and Training the Next Generations	Parallel 1: Neutrino Parallel 2: Rare processes	Colloquium on Rare Processes and Precision Measurements	Colloquium on Underground Physics	Colloquium on Energy Frontier Physics	Presentation: Snowmass Early Career	Panel: Interconnections with other fields	
3:00 PM												
3:30 PM										Coffee		
4:00 PM		Coffee	Parallel 1: The next accelerators Parallel 2: LQCD	Parallel 1: Lepton Colliders Parallel 2: Cosmic	Colloquium on Instrumentation	Colloquium on new Accelerators and R&D	Colloquium on Theory	Colloquium on Computing	Parallel 1: Underrepresented Minorities Parallel 2: Instrumentation projects	Talks: National, International Leaders		
5:00 PM	Pre-Registration	Planning US HEP: past, present, future										
6:00 PM			DEI: Talks and Panel	Colloquium on Community Engagement		Colloquium on Cosmic Frontier Probes of Fundamental Physics	Colloquium on Neutrino Physics	Quantum Information Science in HEP	talks DOE, NSF, FNAL Director, other US labs	Panel International Status and Plans		
7:00 PM												
8:00 PM			Reception & Poster & Industry Partners	stry Networking	Adam Riess Public Lecture	Physics Slam		Colliderscope				
9:00 PM							Conference Dinner					

Busy time: 14 parallel tracks !

Tue 19/07



NEUTRINO FRONTIER ORGANIZATION

■ Conveners:

- Patrick Huber (Virginia Tech)
- Kate Scholberg (Duke)
- Elizabeth Worcester (BNL)



■ Topical Groups

- NF01: Neutrino Oscillations
- NF02: Understanding Experimental Neutrino Anomalies
- NF03: Beyond the SM
- NF04: Neutrinos from Natural Sources
- NF05: Neutrino Properties
- NF06: Neutrino Interaction Cross Sections
- NF07: Applications
- NF08→TFI I: Neutrino Theory
- NF09: Artificial Neutrino Sources
- NF10: Neutrino Detectors
- +liaisons to all other frontiers & SEC


See NF wiki – <https://snowmass21.org/neutrino/start> – for names of topical group conveners, names of liaisons, report drafts, and all things NF

The science drivers for NF

- What are the neutrino masses?
- Are neutrinos their own antiparticles?
- How are the masses ordered?
- What is the origin of neutrino mass and flavor?
- Do neutrinos and antineutrinos oscillate differently?
- Discovering new particles and interactions
- Neutrinos as messengers

(Patrick Huber)

Significant
growth in activity
since last
Snowmass



MAJOR THEMES IN NEUTRINO FRONTIER

(Kate Scholberg)

- A defining and somewhat unique aspect of NF is breadth and balance of effort across a wide range of physics topics, timescales, sizes, and costs, with significant need for collaboration with other frontiers and across boundaries of what is typically considered particle physics
- Physics beyond the (3-neutrino) Standard Model is emerging as a major focus of NF – this includes investigation of anomalies in neutrino oscillation measurements, precision measurements of neutrino oscillation that are sensitive to new particles and interactions, and use of neutrino experiments to search for other new physics, such as dark matter
- Use of neutrinos as messengers carrying information about otherwise inaccessible systems, particularly as participants in multi-messenger astronomy, is a growing area of interest in NF

MAJOR THEMES IN NEUTRINO FRONTIER

(Kate Scholberg)

- DUNE/LBNF is the largest project in the NF portfolio, with extensive investment from the US and international partners to make precision neutrino oscillation measurements as well as a broad program of astrophysics topics and BSM searches. Snowmass/P5 will be particularly focused on the 2nd phase of DUNE, which is necessary to achieve the full DUNE physics scope, and which also offers opportunities to expand the physics scope beyond that initially envisioned
- There is significant synergy with other frontiers/fields in detector, accelerator, and computing development
- Community engagement is critical for the success of NF
- Early career scientists are central to all of the ongoing and planned research in NF

Synergistic aspects:

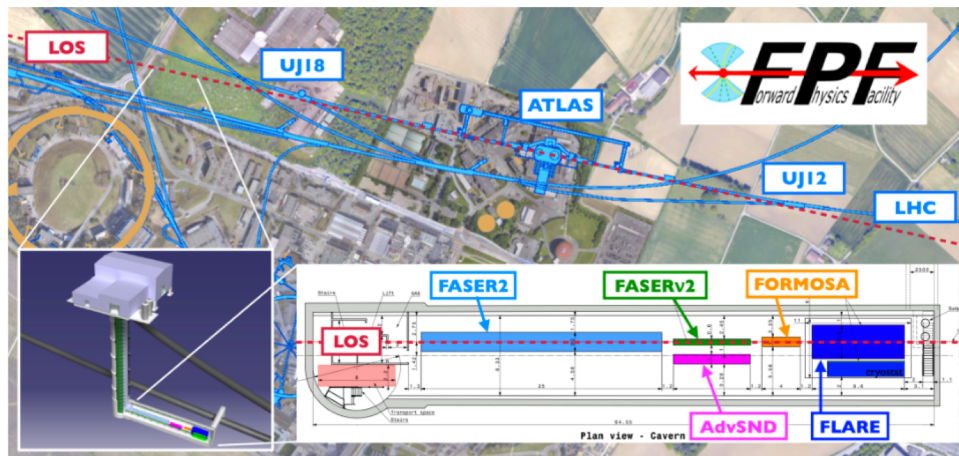
RPF & IF :

Experiment	Dark Sectors	V Physics	CLFV	Precision tests	R&D
Lepton flavor violation: μ -to-e conversion					
Lepton flavor violation: μ decay					
PIP2-BD: \sim GeV Proton beam dump					
SBN-BD: \sim 10 GeV Proton beam dump					
High energy proton fixed target					
Electron missing momentum					
Nucleon form factor w/ lepton scattering					
Electron beam dumps					
Muon Missing Momentum					
Muon beam dump					
Physics with muonium					
Muon collider R&D and neutrino factory					
Rare decays of light mesons					
Ultra-cold neutrons					
Proton storage ring for EDM and axions					
Tau neutrinos					
Proton irradiation facility					
Test-beam facility					

Booster
replacement
(beam upgrade)

Synergies at the
machine level as
well as physics

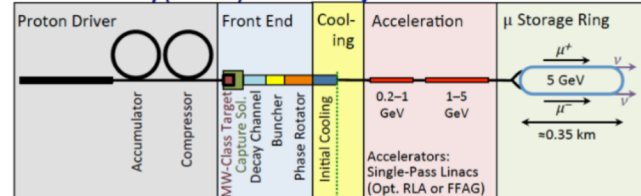
EF (HL-LHC)



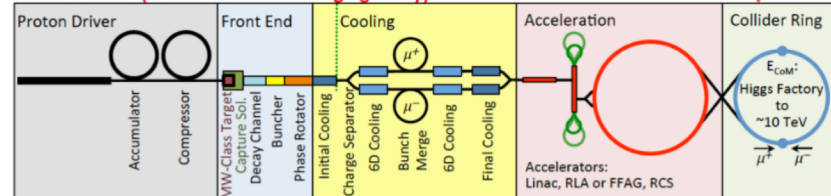
Figures from SNOWMASS neutrino colloquium by M. Toupes

AF (muon collider)

Neutrino Factory (NuMAX)



Share same complex
Muon Collider (Muon Accelerator Staging Study)

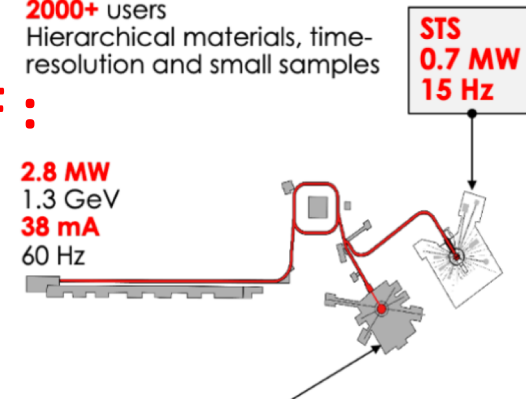


2028 after STS

- 2000+ users
- Hierarchical materials, time-resolution and small samples

AF :

2.8 MW
1.3 GeV
38 mA
60 Hz



FTS
2 MW
45 pulses/sec

STS
0.7 MW
15 Hz

ν Factory Goal:
 $O(10^{21})$ μ /year
within the accelerator
acceptance

μ -Collider Goals:
126 GeV \leftrightarrow
 $\sim 14,000$ Higgs/yr
Multi-TeV \leftrightarrow
Lumi $> 10^{34}$ cm $^{-2}$ s $^{-1}$

Snowmass'21 Accelerator Frontier View

AF Topical Groups provided input to community/P5 to evaluate options on future facilities:

- I. Accelerators for Neutrinos
- II. Accelerators for Rare Processes
- III. Colliders

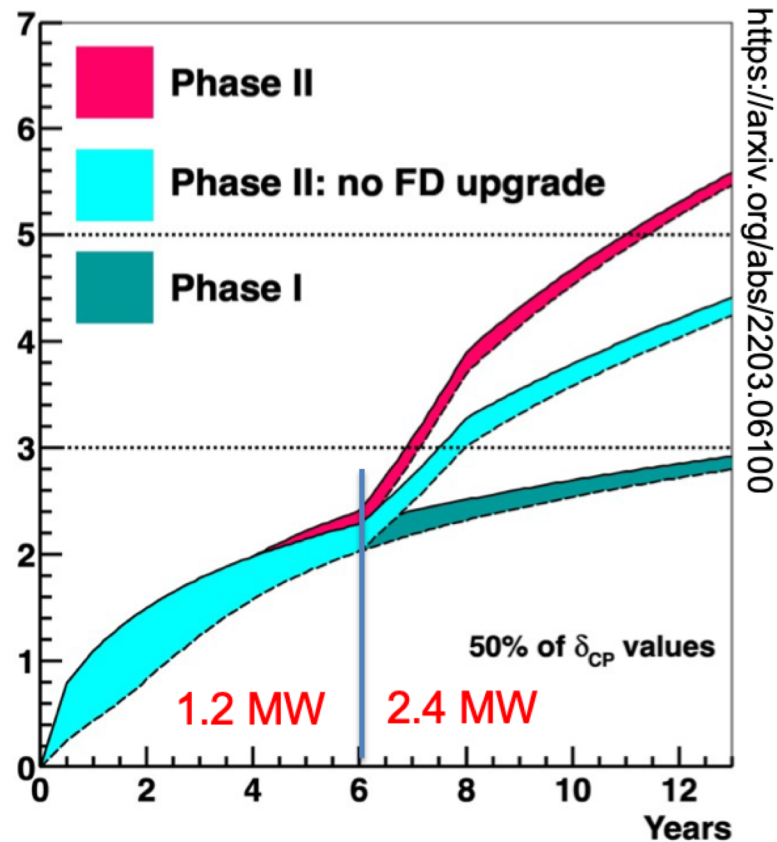
Multi-MW ν Beams for DUNE

LBNF/DUNE Project – Phase I:

- By 2032: **1.2 MW** proton beam (120 GeV, MI) on target + near ν -detector + 20 kton LAr ν -detector in Lead, SD
- Expected rate of “physics” outcome – $\sqrt{\Delta\chi^2} = 3\sigma$ in δ_{CP} , in the **first 6 years** (also Δm^2_{32} , $\sin^2\theta_{23}$, $\sin^2 2\theta_{13}$)
- To get to $\sim 5\sigma$ will take too long, plus – competitor experiment *Hyper-K* in Japan (30 GeV J-PARC p beam)

Proposed LBNF/DUNE Phase II :

- By 2038: **~ 2.4 MW** proton beam + new near ν -detector + extra 20 kton LAr ν -detector
- Expected to get to $\sim 5\sigma$ in δ_{CP} in the **following 6 years**



17

Fermilab News (Lia Merminga)

Major Science & Technology Initiatives



Neutrino science and LBNF/DUNE



Collider science



Precision science



Cosmic science



Accelerator science & technology



Fermilab News (Lia Merminga)

Delivering on LBNF/DUNE is Fermilab's highest priority

S&T

DUNE: The world's most capable neutrino experiment, driven by LBNF and PIP-II

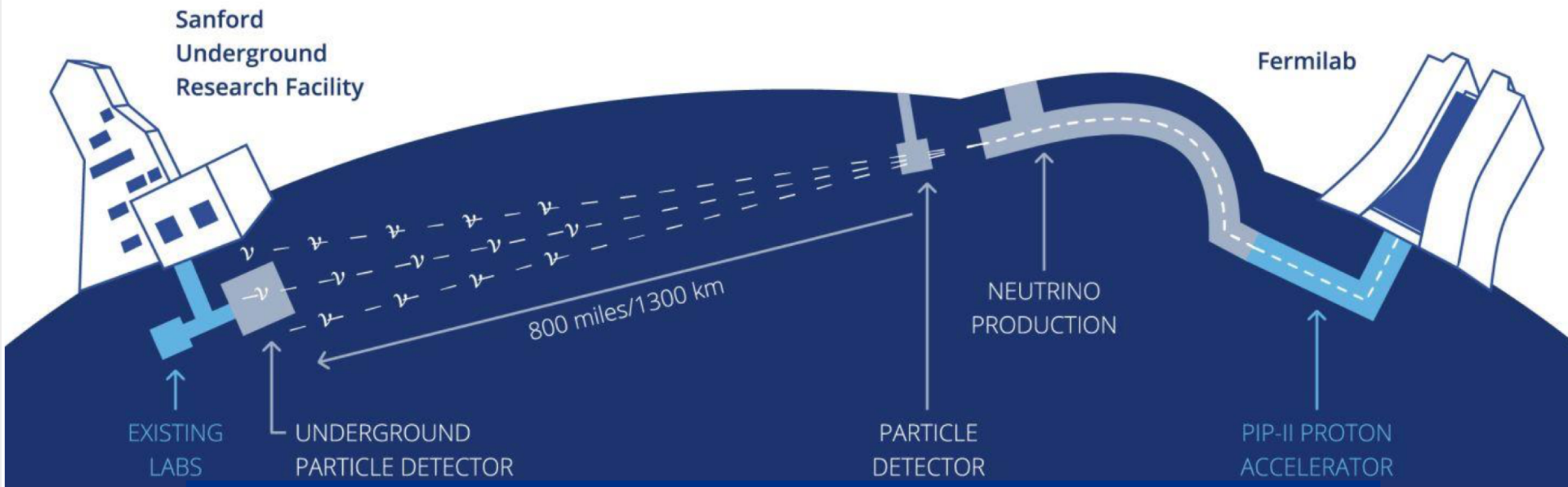


Gina Rameika Sergio Bertolucci

DOE CD-1RR review completed

Vision for Neutrino Science

US/Fermilab is universally acknowledged as the world leader in neutrino science for decades to come

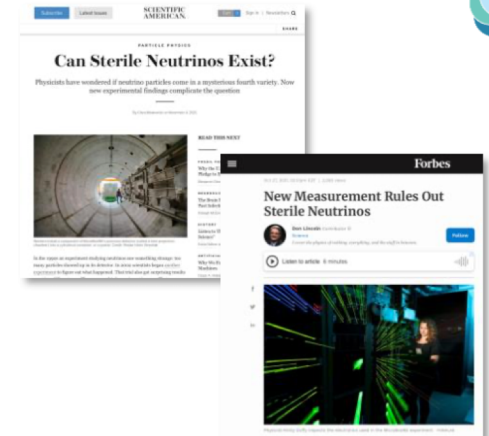
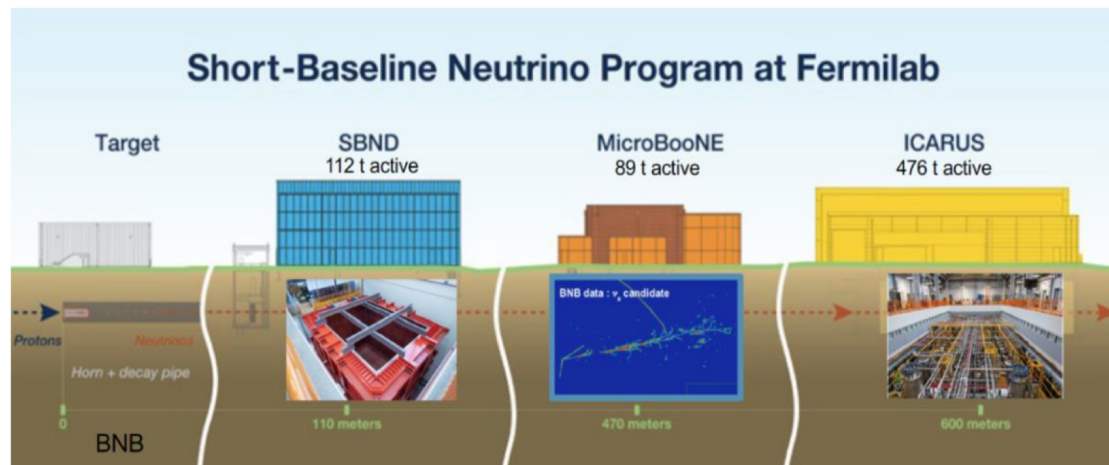


Fermilab News (Lia Merminga)

Short Baseline Neutrino (SBN) program

The SBN program is a P5 report recommendation:
Pursue an exciting accelerator-based short baseline neutrino program at Fermilab, SBN

- to attract national and international neutrino community to Fermilab
- perform experiments using liquid argon detector technology – basis of DUNE
- establish and train diverse community of researchers needed for DUNE



MicroBooNE made a big splash with its recent flagship results:

- Liquid argon technology works extremely well, good news for DUNE
- Seven papers released simultaneously

Science target: resolve the 4.8σ MiniBooNE low energy excess, with the possibility of discovering sterile neutrinos or other exotic neutrino physics

CERN News (Fabiola Gianotti)



Initial remarks

The contributions of DOE, NSF and US scientists (~17% of CERN's users), in particular the intellectual contributions of the young scientists, have been crucial to the success of the LHC and CERN more generally.

They will continue to be crucial also in the future for HL-LHC and beyond. In particular, FCC (or any other future collider at CERN) will only be possible with the strong participation of the US community (ideas, technologies, resources).

Likewise, CERN is committed to support LBNF/DUNE and open to discuss collaboration on future projects in the US.

CERN News (Fabiola Gianotti)



CERN Neutrino Platform

Established in 2014, following 2013 update of ESPP:

“CERN should develop a neutrino programme to pave the way for a substantial European role in future long-baseline experiments. Europe should explore the possibility of major participation in leading long-baseline neutrino projects in the US and Japan.”

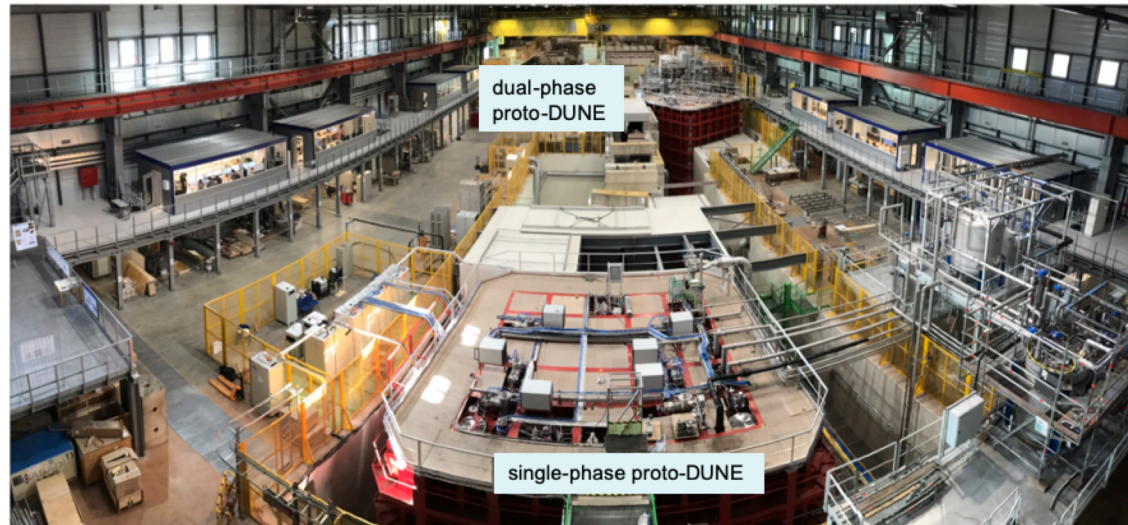
Main activities at the NP since the beginning

- ❑ Extensions of EHN1 hall at North Area to **provide space and beam facility for ν detectors**
- ❑ Refurbishment of **ICARUS** detector for short-baseline neutrino programme at Fermilab
- ❑ Construction and operation of **two prototypes for DUNE** (single-phase; dual-phase → vertical-drift technology)
→ crucial to establish detector feasibility, validate technology and finalise technical choices
- ❑ Construction of **cryostats** for two (out of four) modules of DUNE
- ❑ Construction of **Baby-Mind and ND280** upgrade detectors for the T2K experiment in Japan

With ~ 900 collaborators from ~30 countries

Construction and test of two DUNE detector prototypes at CERN's Neutrino Platform:

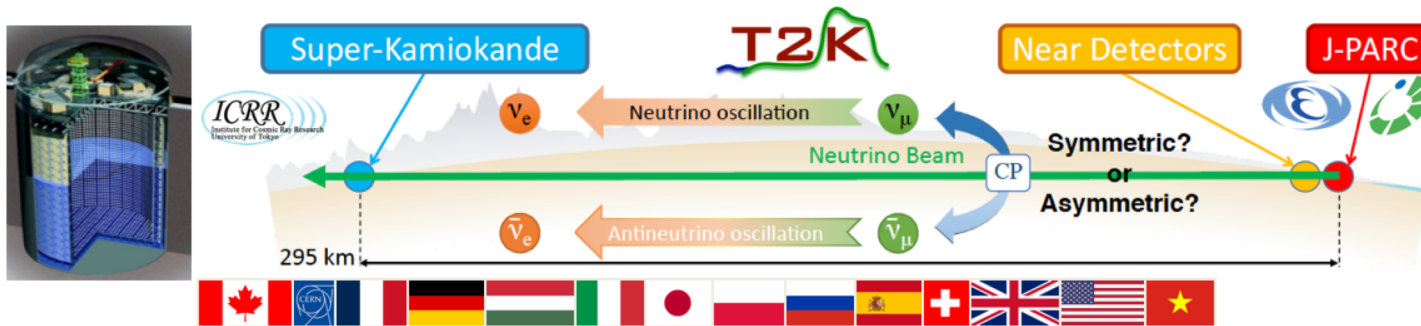
- ❑ 11x11x11 m³ cryostat
- ❑ ~750 tons LAr each
- ❑ 1 DUNE module: x 20 proto-DUNE



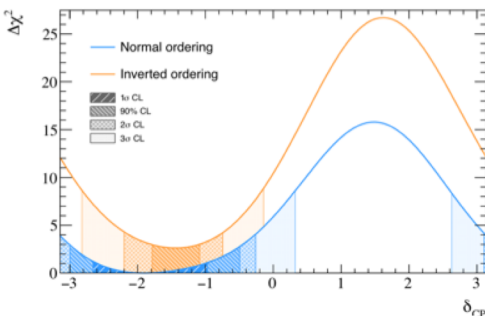
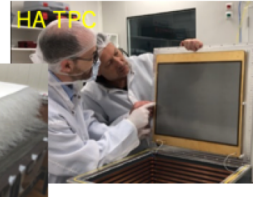
KEK News (Masa Yamauchi)

T2K: Long baseline neutrino oscillation experiment

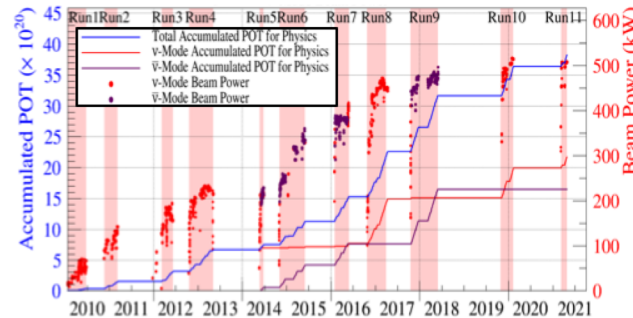
■ Search for *lepton CP violation*



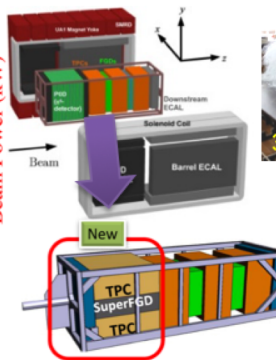
~470 members, 74 Institutes, 13 countries



First constraint on lepton CP asymmetry has been obtained.



High power neutrino beam; ~520kW (achieved)
→ Intensity upgrade up to 1.3MW
& Near-detector upgrade are on going.



Precise measurement with doubled data by ~2026 is expected.

KEK News (Masa Yamauchi)



Hyper-Kamiokande (HK) by U. Tokyo and KEK

- Project
 - 190kt-FV Hyper-Kamiokande Detector (UT)
 - Upgrade of J-PARC to 1.3MW (KEK)
- Physics goals
 - CPV in neutrino sector
 - Search for proton decay
 - Atm-nu, solar-nu and supernova nu
- International project hosted by U.Tokyo & KEK
- **Funding approved and construction started in**
 - Preparation of cavern excavation, production of PMTs started
 - J-PARC upgrade on-going
- Aiming to start operation in 2027.



Hyper-Kamiokande Detector



~500 members
from 20 countries



Delivered PMT for HK

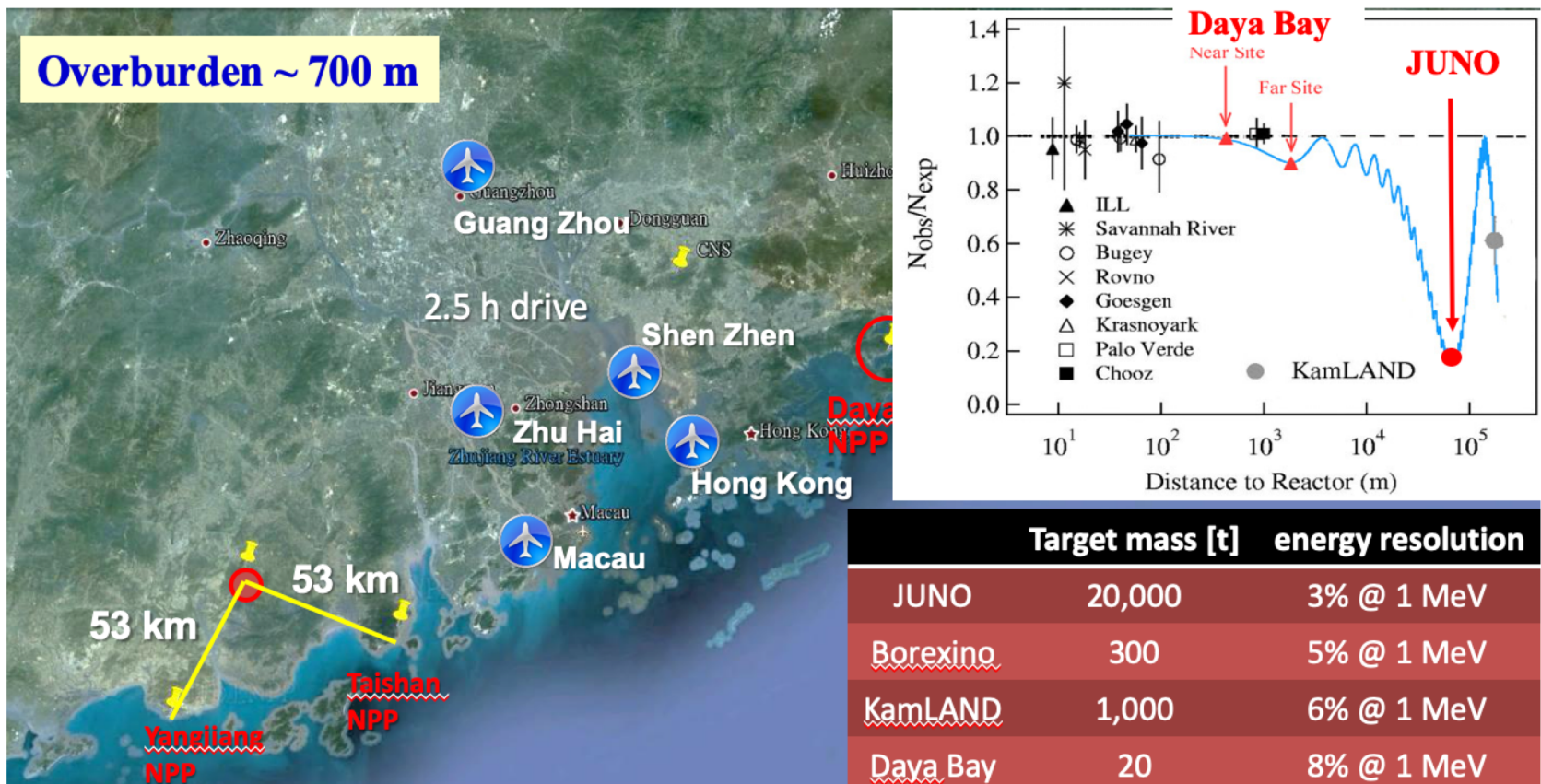


Access tunnel excavated

IHEP News (Yifang Wang)

JUNO Experiment

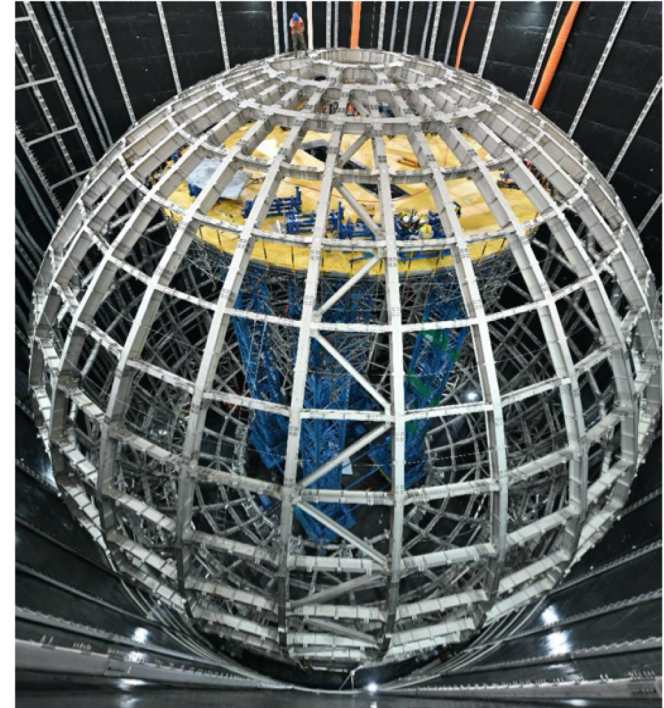
- A 20 kt liquid scintillator detector at ~53 km baseline from reactors for neutrino mass hierarchy, precision determination of oscillation parameters and astrophysics



IHEP News (Yifang Wang)

Construction of JUNO

- Civil construction mostly finished
- Components mostly produced, including a new type of high efficiency 20" MCP-PMTs
- SS structure completed, acrylic sphere bonding in progress
- PMT installation will start in a few months, LS Filling will start next year
- High energy resolution(3%@1MeV) and cleanness(10^{-17} g/g) seems realizable



HEPAP Statement (JoAnne Hewett)

Snowmass is critical piece of U.S. strategic planning

Unique, key elements of Snowmass

- Community driven
- Science driven
- Everyone can contribute
- Full coverage of the field
- Vision of what could be
- Brings science communities together
- Brings different generations of researchers together
- Defines key scientific questions and approaches

Snowmass results guide the direction of the field and are the scientific input to the next P5



1984 DPF Summer Study on the Design and Utilization of the Superconducting Super Collider (SSC) (Snowmass 84)
22 June-12 July 1984, Snowmass, CO, United States (C84-06-22)

Part of the SNOWMASS series

Note: CN changed to GCP/84-5/7/1984 (SSC), and back to follow Snowmass series

Physics of the Superconducting Supercollider: Proceedings, 1986 Summer Study, June 23 - July 11, 1986, Snowmass, Colorado

B. Donaldson (LBL, Berkeley)(ed.), J.N. Marx (LBL, Berkeley)(ed.)
1986

770 pages

Contribution to: Snowmass '86 Summer Study on the Physics of the Supercollider
Published: 1988 in New York by American Institute of Physics

High-energy physics in the 1990s. Proceedings, Summer Study, Snowmass, USA, June 27 - July 15, 1988

(Bjork, Jostes) (SLAC)(ed.)

1988

814 pages

Contribution to: 1988 DPF Summer Study on High-energy Physics in the 1990s (Snowmass 88)

Report number: SLAC-88-0601-1988-001



Proceedings of the 1996 DPF/DPB Summer Study
on New Directions in High-energy Physics



Proceedings of Snowmass 2001

Snowmass Village, Colorado
June 30-July 21

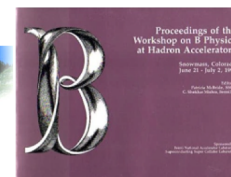
Proceedings, 2005 International Linear Collider Physics and Detector Workshop and 2nd ILC Accelerator Workshop (Snowmass 2005)

Norman A. Graf

Jan 31, 2006

Contribution to: 2005 International Linear Collider Physics and Detector Workshop and 2nd ILC Accelerator Workshop

Report number: SLAC-05-706



HEPAP Statement (JoAnne Hewett)

U.S. Administration and Congress have supported the P5 Plan

Spawned numerous U.S. International agreements

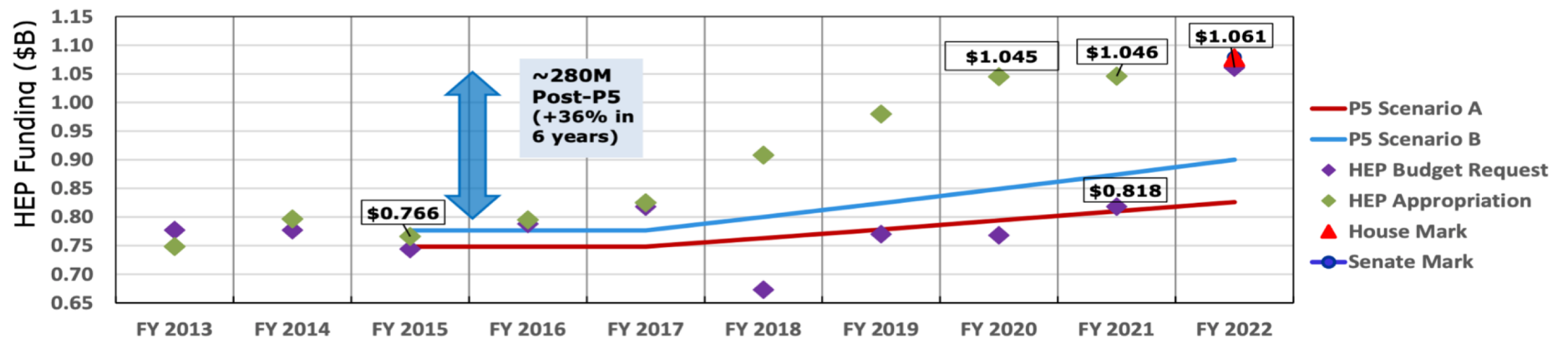
- U.S. – CERN Agreement, May 2015
- UK – U.S. Science & Technology Agreement, Sep 2017
- DOE-DAE Project Annex II on Neutrino Research, Apr 2018
- U.S. – Italy Neutrino Agreement, Jun 2018

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- U.S. – CERN FCC and HL-LHC Agreement, Dec 2020



CERN – FNAL HL LHC Agreement, Mar 2021



A message from HEPAP (JoAnne Hewett)

Passing the Baton

Put Captions Here

Snowmass was WONDERFUL!!!

Snowmass results will be critical input to P5

- The hard work was impressive and is an important documentation of visions for our field

Turning towards P5

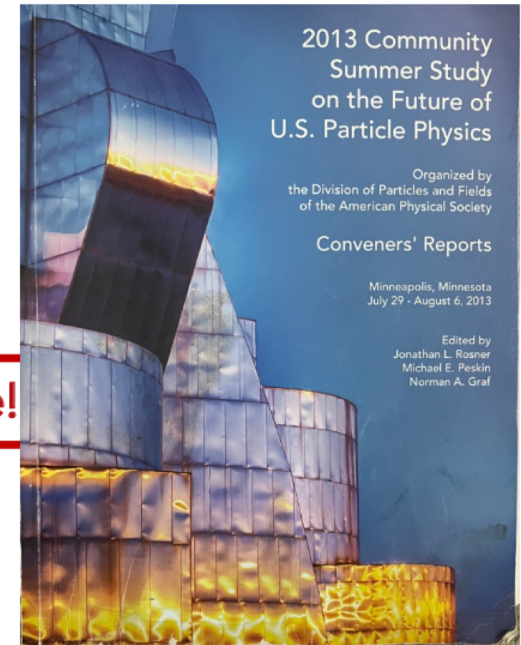
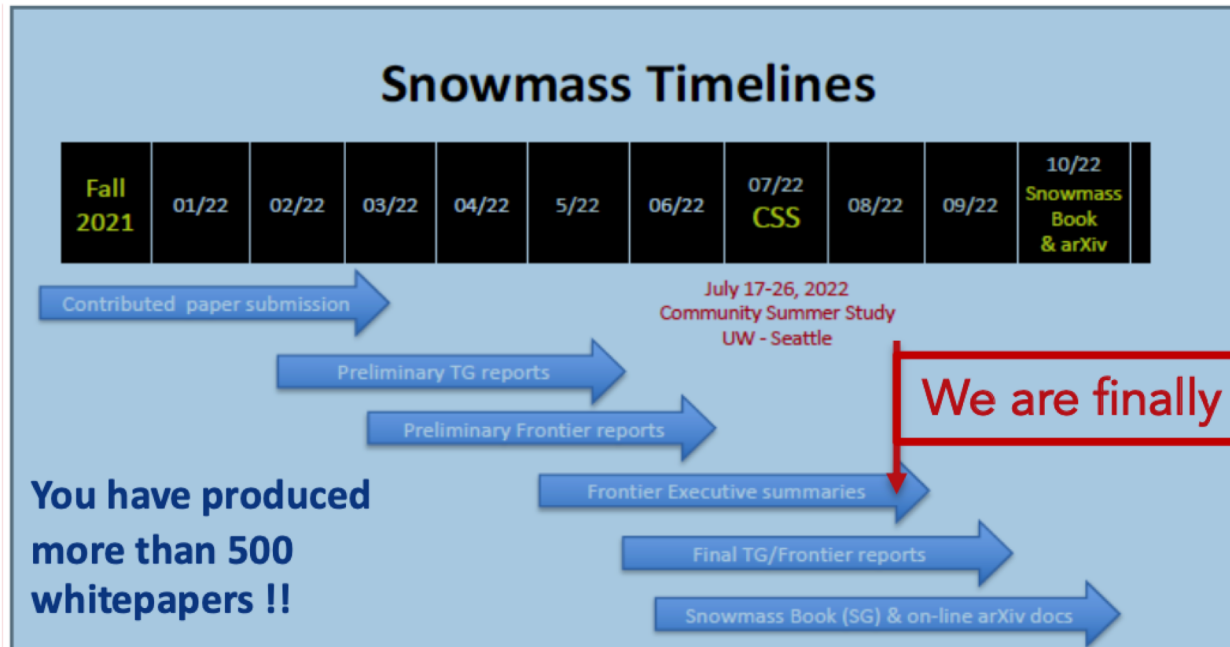
- Every idea presented at Snowmass will receive due consideration
 - Report is not written
 - Decisions are not made
 - P5 will take a fresh look at our project program
 - P5 is a process and the process will be followed
- Next P5

Next P5 chair:



Timeline for Snowmass Book

(Joel Butler)



- March 15: Contributed papers (a.k.a. White Papers)
- May 31: Preliminary Topical Group Reports
- June 30: Preliminary Frontier Reports
- July 17 – 26: Converge on reports for all the frontiers and produce executive summaries representing the views of their communities and providing the basic input needed for P5
- September: draft Executive Summary and Report Summary
- October- November: Snowmass Book finalized and ready for submission

- Cover from Snowmass 2013 report, ~ 350 pages
- The new report will be ~500 pages
- All Contributed Papers will remain part of the permanent record of Snowmass

Snowmass 2021 Summary

(Prisca Cushman)

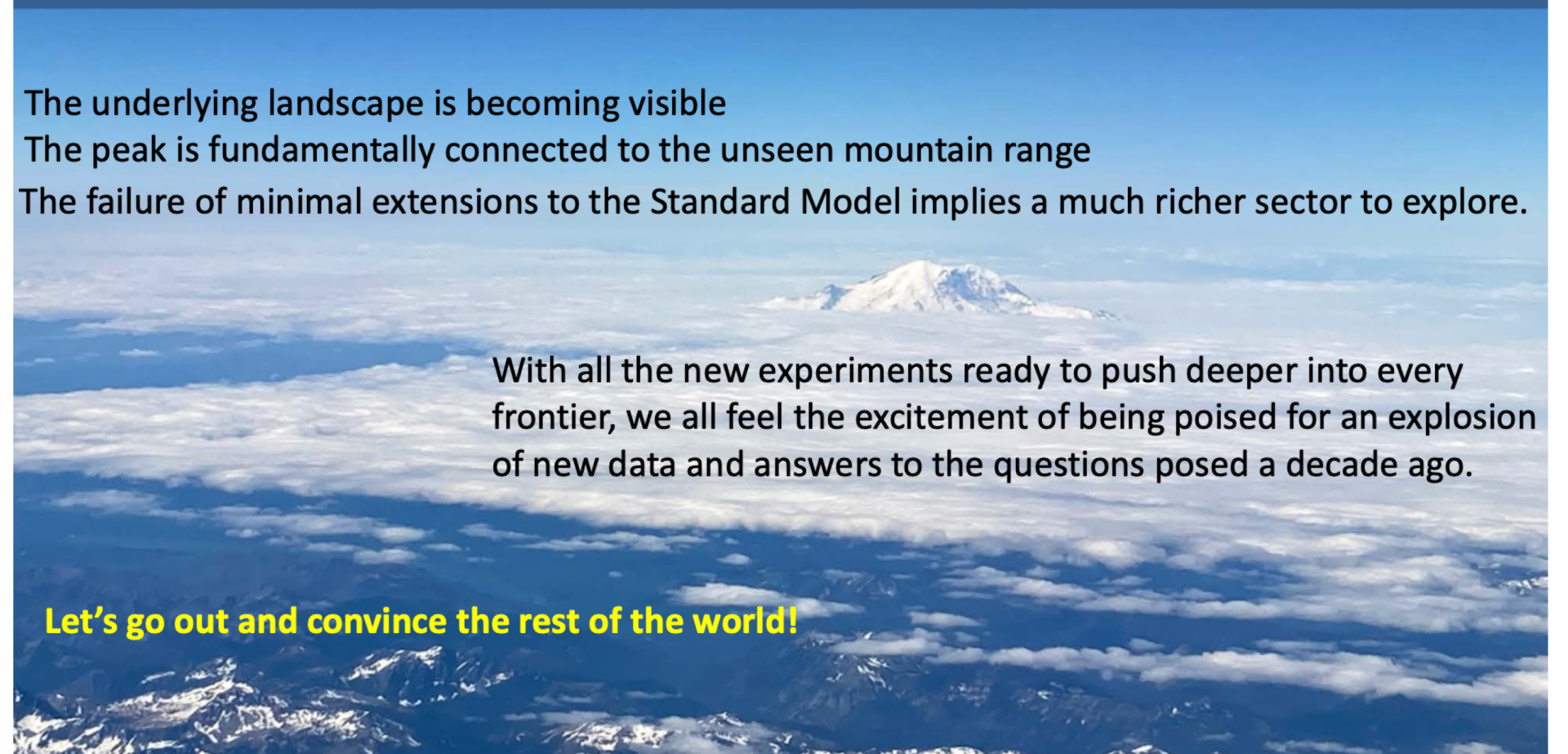


The Beginning of a new era

The underlying landscape is becoming visible

The peak is fundamentally connected to the unseen mountain range

The failure of minimal extensions to the Standard Model implies a much richer sector to explore.



With all the new experiments ready to push deeper into every frontier, we all feel the excitement of being poised for an explosion of new data and answers to the questions posed a decade ago.

Let's go out and convince the rest of the world!